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TYPE AND AMOUNT OF AVAILABLE PAST INSTANCES IN CONCEPT LEARNING.

BY- BLAINE, DANIEL D. AND OTHERS
AMERICAN EDUCATIONAL RESEARCH ASSN., WASH., D.C.

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IN DEMONSTRATING THE FACILITATIVE EFFECT OF AVAILABLE PAST INSTANCES IN CONCEPT LEARNING, IT WAS PREDICTED THAT AVAILABILITY WOULD BE FACILITATED WHEN SUBJECTS WERE PROVIDED WITH A CORRECT RECORD (CR) OF CLASSIFICATION. IT WAS ALSO PREDICTED THAT SUBJECTS MORE CAPABLE OF RECALLING THE CORRECT CLASSIFICATION OF PAST INSTANCES WOULD PROFIT LESS FROM THE AVAILABILITY OF A CR, WHILE SUBJECTS LOW IN ASSOCIATIVE MEMORY WOULD PROFIT MORE FROM AN INCREASE IN THE NUMBER OF INSTANCES INVOLVED IN THE CR. SOME 59 HIGH-SCHOOL STUDENTS WERE ADMINISTERED A SHORT-TERM MEMORY FOR ASSOCIATIONS TEST AND A CONCEPT LEARNING TASK INVOLVING A FOUR CATEGORY, TWO-DIMENSIONAL CONJUNCTIVE CONCEPT PROBLEM. THE RESULTS INDICATE THAT THE AVAILABILITY OF A CR WAS HIGHLY FACILITATIVE. HOWEVER, THE HYPOTHESIS THAT SUBJECTS LOW IN MEMORY WOULD PROFIT MORE FROM INCREASING AVAILABILITY WAS NOT CONFIRMED. IT WAS CONCLUDED THAT FOR AVAILABILITY TO BE FACILITATIVE, THE SUBJECT MUST BE PROVIDED WITH INFORMATION RELEVANT TO THE SOLUTION OF THE TASK. GIVEN THAT SUCH INFORMATION IS AVAILABLE THERE IS AN OPTIMAL LEVEL OF AVAILABILITY OF SUCH INFORMATION WHICH IS, AT LEAST IN PART, A FUNCTION OF THE SUBJECT'S ABILITY TO UTILIZE IT EFFICIENTLY. THIS PAPER WAS PRESENTED AT THE ANNUAL MEETING OF THE AMERICAN EDUCATIONAL RESEARCH ASSOCIATION (CHICAGO, FEBRUARY 1968). (CG)

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TYPE AND AMOUNT OF AVAILABLE PAST INSTANCES IN CONCEPT LEARNING[1]

Daniel D. Blaine, J. L. Dunham, and Thomas W. Pyle

The University of Texas at Austin

Several authors (e.g. Bourne, Goldstein, & Link, 1964; Cahill & Hovland, 1960; Pishkin, 1967; Pishkin & Wolfgang, 1965; and Pishkin, Wolfgang, & Rasmussen, 1967) have demonstrated the facilitative effect of available past instances in concept learning. This facilitative effect has typically been interpreted as a reduction in the memory requirements associated with a concept learning task. Beyond this interpretation, few attempts have been made to determine the aspects of available past instances which are important to the solution of a concept task.

In one attempt, Pishkin and Wolfgang (1965) employed a four-category problem with which they varied the type of instances available. In one group, instances which Ss classified correctly were available in the correct category. In a second group, instances which had been classified incorrectly were available in the incorrect category which S had chosen. In the third group, both types of instances were available. In the groups where the available instances provided S with a correct record (CR) of classification, availability was facilitative. In the second group S was provided with a record of his own incorrect responses (SR), and availability did not facilitate performance. Thus, availability was facilitative only when Ss had instances available which they had classified correctly.

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This suggests that the facilitative effect of availability is due, at least in part, to providing Ss with a record of instances and their correct classification. Therefore, in the present study it was predicted that avail-

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was a four-category, two-dimensional conjunctive concept problem. The stimuli were on 3 x 3 white cards and consisted of six binary dimensions: (1) number of figures: 1 or 2, (2) size of figures: large or small, (3) color of figures: black or white, (4) shape of figures: circle or square, (5) number of borders: 1 or 2, and (6) type of borders: solid or broken.

Each S sat on the opposite side of a table from E with a 22" x 28" white board divided into four columns (labeled A, B, C, and D) on the table facing S. It was explained to S that each of the cards could be classified as an A, B, C or D on the basis of two of the dimensions. To familiarize Ss with the task and the procedure, an example problem was given in which they learned to classify instances after being informed which dimensions were relevant (number and type of borders). All Ss received the example problem under the zero availability condition. Each S was then given additional instructions appropriate to the condition to which he was assigned. As in the example, S was given the deck of 64 cards which he looked at one at a time, telling E to which category he thought the card belonged. After responding S was told whether he was right or wrong and, if wrong, to which category the card belonged. S had an unlimited response interval on each trial. Depending upon the experimental condition, the cards to which S responded incorrectly were placed in the correct category (CR) or the incorrect category (SR) chosen by S with either 1, 2, or 4 instances allowed to accumulate in each category. When the specified number in a category was exceeded, the earliest instance in that category was removed. Instances which S classified correctly were placed face down to the side of the board. In the zero availability group, all instances were placed face down in the same manner. S's responding was terminated after 64 trials or

when a preset criterion of 12 consecutive correct responses was achieved.

Insert Figure 1 About Here

Results

The mean trials to criterion for each of the conditions are plotted in Figure 1. A 2 x 2 x 3 analysis of variance (Memory X Type X Amount) was computed with trials to criterion as the dependent measure. The main effect of Type was significant, $F(1, 38) = 60.94$, $p < .001$, with CR availability performance superior to SR performance. No other main effect or interaction was significant, although the Amount effect and the Type X Amount interaction had p's of less than .08.

To test the prediction that CR availability would facilitate Ss low in memory to a greater extent than Ss high in memory, a comparison was made between the H and L groups in zero and CR-1 availability. The Memory X Type interaction for these two groups was not significant, $F(1, 13) = 0.75$ $p = .59$.

An analysis of the effect of Memory and Amount within the CR condition yielded a significant main effect for Memory, $F(1,19) = 4.74$, $p < .05$, and a significant Memory X Amount interaction $F(2,19) = 6.5$, $p < .01$.

In addition to the above analyses, a weighted means comparison between zero availability and the CR groups was significant, $F(1,45) = 27.75$, $p < .001$. A similar comparison between zero availability and the SR groups was not significant, $F(1,45) = .013$, $p = .91$.

Discussion

The results indicate that the availability of an SR did not facilitate

performance while the availability of a CR was highly facilitative. This suggests that, for available instances to be facilitative, it is necessary for such instances to be available in such a way the S can readily associate the correct category with the appropriate instance. The availability of a CR could be facilitative for two reasons. First, in determining the relevant dimensions, S can gain information about the possible relevancy of dimensions by comparing two or more instances for which the correct classification is known. With the availability of a CR, S is provided with a basis of comparison while with an SR he is not. Secondly, once the relevant dimensions have been determined by S, a CR specifies the combination of values on the relevant dimensions which belong in a particular category. Again, an SR does not provide such information. Ss with an SR available were forced to rely upon memory for the correct classification of the available instances.

Pishkin and Wolfgang (1967) found that when Ss were informed of the correct classification of error instances, availability did not have a facilitative effect. Feedback correction as employed by Pishkin (1967) was given under all conditions in the present study, and a facilitative effect due to the availability of a CR was still found. The task employed by Pishkin (1967) was a four-category problem with one, four-valued dimension relevant (Wisconsin Card Sorting Test). In the present study, a four-category problem was also employed; however, two-binary dimensions were relevant. Bourne, et al. found that availability was less facilitative in less complex tasks, i.e. when fewer dimensions were relevant. This would account for the lack of availability effect found by Pishkin and Wolfgang (1965).

In the present study, availability was interpreted as aiding Ss in de-

termining the relevant dimensions and associating the value combinations with the proper categories. Any change in the concept task which reduced the difficulty of either of these aspects would be expected to reduce the facilitative effect of availability. Pishkin and Wolfgang (1965) did not employ feedback correction, and S gained only indefinite information from incorrectly classified instances concerning value specification. With the introduction of feedback correction by Pishkin (1967) S gained definite information concerning value specification. This could reduce the difficulty of the task and consequently, reduce the facilitative effect of availability.

The hypothesis that low memory Ss would profit more from the availability of a CR was not confirmed. The indication is that the introduction of CR-1 availability is only slightly more facilitative for low memory Ss than for high memory Ss. Such availability is highly facilitative for both memory groups.

The hypothesis that, given instances available in the correct category, Ss low in memory would profit more from increasing availability was disconfirmed. The fact that the interaction reached significance in the direction opposite that predicted indicated that Ss high in memory profited more from increasing availability than did Ss low in memory. Ss low in memory achieved optimal performance at one instance per category available with a decrease in the facilitative effect of availability at levels above one. Bourne, et al. (1964 interpreted a similar effect as due to a lack of time to process the available information. When the Ss were given an unlimited response interval performanc continued to improve with increasing availability. Since an unlimited respons interval was afforded all Ss in the present study the optimal level of low memory Ss cannot be interpreted as due to lack of time to process the availabl

information. The mean number of trials to criterion for Ss high in memory continued to decrease as the limit on the number of instances available within a given category increased, suggesting that Ss scoring high on the memory test could utilize the information efficiently while low memory Ss were unable to do so.

It was concluded that for availability to be facilitative, it must provide S with information relevant to the solution of the task, and given that such information is available, there is an optimal level of availability of such information which is, at least in part, a function of S's ability to utilize it efficiently.

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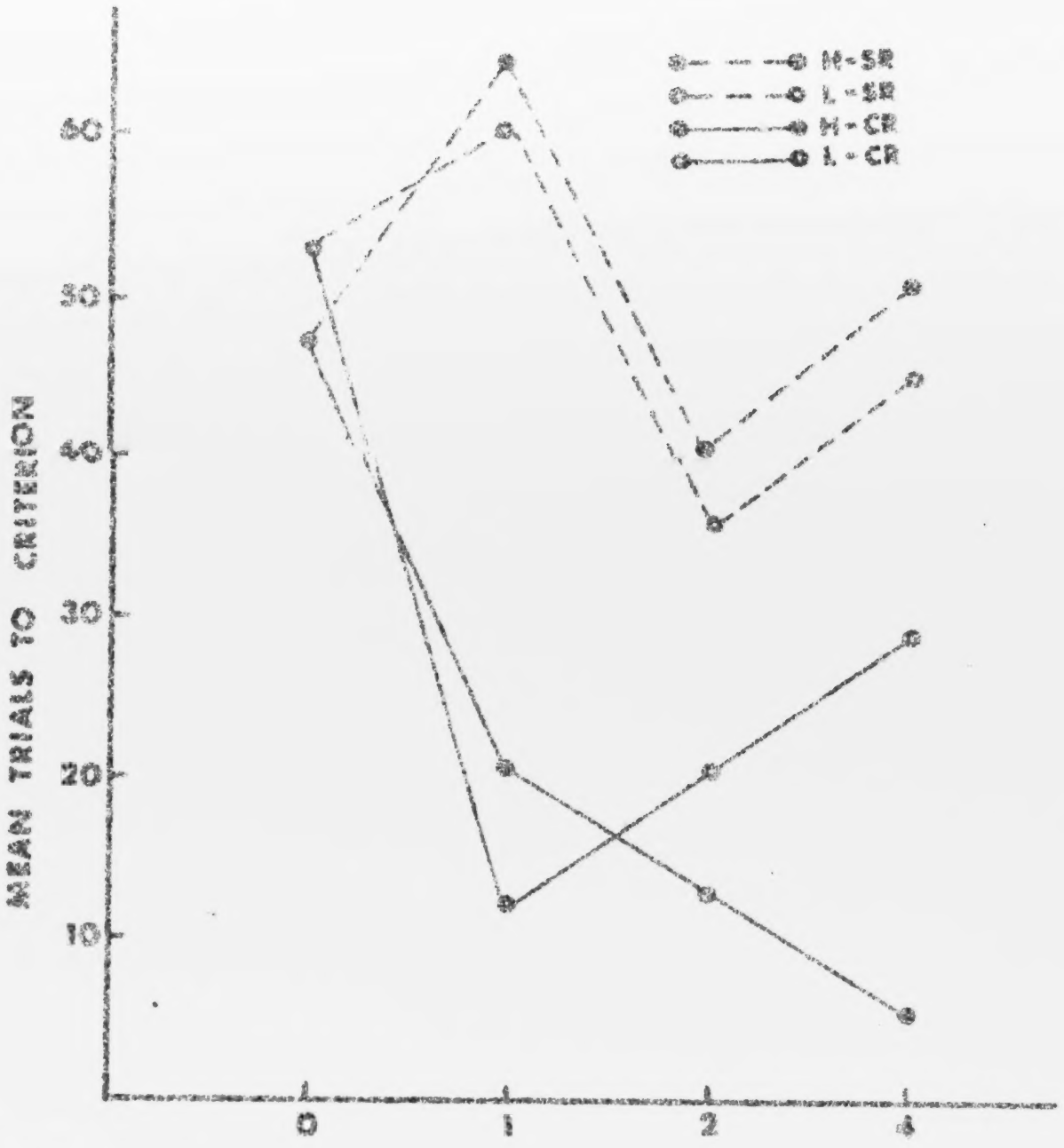

Fig. 1. Mean trials to criterion for all conditions of Memory, and Type and Amount of availability.